Georgia. The lowest observed water temperatures are: 46° at Marquette, Michigan; 46°.1 at Eastport, Maine; and 50°.2 at Duluth, Minnesota. The smallest ranges are: 2° at Baltimore, Maryland; 2°.5 at Eastport, Maine; 2°.6 at Jacksonville, Florida; and 2°.8 at New London, Connecticut. The largest ranges are: 15°.1 at Escanaba, Michigan; 16°.3 at Duluth, Minnesota; and 17° at Marquette, Michigan.

*Temperature of water for July, 1884.*

| Station. | Temperature at bottom. | | Range. | Average depth, feet and inches. | | Mean temperature of the air at station. |
|---|---|---|---|---|---|---|
| | Max. | Min. | | | | |
| | ° | ° | ° | ft. | in. | ° |
| Atlantic City, New Jersey | 73.0 | 68.0 | 5.0 | 2 | 11 | 70.6 |
| Alpena, Michigan | 69.8 | 62.5 | 7.3 | 12 | 4 | 61.3 |
| Augusta, Georgia | 88.2 | 75.8 | 12.4 | 8 | 8 | 80.9 |
| Baltimore, Maryland | 78.0 | 76.0 | 2.0 | 9 | 8 | 75.1 |
| Block Island, Rhode Island | 65.3 | 59.6 | 5.7 | 8 | 0 | 66.0 |
| Boston, Massachusetts | 65.6 | 57.0 | 8.6 | 21 | 0 | 68.0 |
| Buffalo, New York | 70.8 | 64.3 | 6.5 | 10 | 0 | 64.9 |
| Canby, Fort, Washington Territory | 65.7 | 61.1 | 4.6 | 15 | 5 | 58.6 |
| Cedar Keys, Florida | 88.5 | 79.9 | 8.6 | 10 | 9 | 82.6 |
| Charleston, South Carolina* | 87.4 | 78.1 | 9.3 | 42 | 1 | 82.2 |
| Chicago, Illinois | 71.2 | 63.7 | 7.5 | 8 | 6 | 69.2 |
| Chincoteague, Virginia | 82.0 | 70.4 | 11.6 | 3 | 11 | 73.2 |
| Cleveland, Ohio | 73.4 | 69.1 | 4.3 | 14 | 0 | 69.0 |
| Detroit, Michigan | 72.2 | 65.9 | 6.3 | 23 | 6 | 69.8 |
| Delaware Breakwater, Delaware | 73.5 | 63.6 | 9.9 | 9 | 7 | 72.2 |
| Duluth, Minnesota | 66.5 | 50.2 | 16.3 | 9 | 11 | 62.4 |
| Eastport, Maine | 48.6 | 46.1 | 2.5 | 14 | 11 | 58.6 |
| Escanaba, Michigan | 67.6 | 52.5 | 15.1 | 18 | 9 | 62.6 |
| Galveston, Texas | 88.7 | 82.0 | 6.7 | 11 | 9 | 85.2 |
| Grand Haven, Michigan | 78.0 | 67.0 | 11.0 | 19 | 0 | 66.9 |
| Indianola, Texas | 91.6 | 84.5 | 7.1 | 8 | 6 | 83.5 |
| Jacksonville, Florida | 87.0 | 84.4 | 2.6 | 18 | 0 | 82.9 |
| Key West, Florida | 89.7 | 85.9 | 3.8 | 16 | 7 | 85.0 |
| Mackinaw City, Michigan | 65.3 | 57.7 | 7.6 | 10 | 0 | 61.3 |
| Macon, Fort, North Carolina | 83.2 | 77.5 | 5.7 | 7 | 7 | 79.1 |
| Marquette, Michigan | 63.0 | 46.0 | 17.0 | 10 | 0 | 59.9 |
| Milwaukee, Wisconsin | 65.2 | 57.1 | 8.1 | 8 | 0 | 65.8 |
| Mobile, Alabama | 87.4 | 78.1 | 9.3 | 16 | 1 | 86.1 |
| New Haven, Connecticut | 72.6 | 66.2 | 6.4 | 16 | 4 | 67.8 |
| New London, Connecticut | 65.0 | 62.2 | 2.8 | 13 | 1 | 67.5 |
| New York City | 72.1 | 67.6 | 4.5 | 16 | 4 | 70.1 |
| Norfolk, Virginia | 80.6 | 71.1 | 9.5 | 16 | 5 | 77.4 |
| Pensacola, Florida | 83.5 | 79.3 | 4.2 | 17 | 5 | 80.5 |
| Portland, Maine | 59.4 | 53.2 | 6.2 | 16 | 7 | 67.5 |
| Portland, Oregon | 70.1 | 65.4 | 4.7 | 61 | 5 | 63.5 |
| Sandusky, Ohio | 78.0 | 70.0 | 8.0 | 11 | 0 | 71.2 |
| Sandy Hook, New Jersey | 71.0 | 66.0 | 6.0 | 1 | 10 | 71.0 |
| San Francisco, California | 62.9 | 56.2 | 6.7 | 39 | 3 | 60.0 |
| Savannah, Georgia | 84.5 | 76.0 | 8.5 | 10 | 6 | 82.4 |
| Smithville, North Carolina | 84.0 | 78.6 | 5.4 | 11 | 1 | 83.3 |
| Toledo, Ohio† | 76.6 | 72.1 | 4.5 | 11 | 7 | 71.6 |
| Wilmington, North Carolina | 83.0 | 76.2 | 6.8 | 18 | 8 | 79.7 |

* Record for 23 days. † Record for 30 days.

## VERIFICATIONS.

### INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.09 per cent. The percentages for the four elements are: Weather, 87.46; direction of the wind, 77.15; temperature, 86.05; barometer, 94.30 per cent. By geographical districts, they are: For New England, 78.82; middle Atlantic states, 86.25; south Atlantic states, 88.82; eastern Gulf states, 83.51; western Gulf states, 90.23; lower lake region, 84.00; upper lake region, 83.68; Ohio valley and Tennessee, 85.47; upper Mississippi valley, 84.08; Missouri valley, 72.98; north Pacific coast region, 87.10; middle Pacific coast region, 98.39; south Pacific coast region, 98.39. There was one omission to predict out of 2,997, or 0.03 per cent. Of the 2,996 predictions that have been made, thirty-nine, or 1.30 per cent., are considered to have entirely failed; one hundred and thirty-four, or 4.47 per cent., were one-fourth verified; three hundred and fifty-four, or 11.82 per cent., were one-half verified; six hundred and forty-one, or 21.40 per cent., were three-fourths verified; 1,828, or 61.01 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

### CAUTIONARY SIGNALS.

During July, 1884, one hundred and twenty-two cautionary signals were ordered. Of these, ninety-seven, or 79.51 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Twenty-three cautionary off-shore signals were ordered, of which number fourteen or 60.87 per cent., were fully justified both as to direction and velocity. Twenty-three, or 100 per cent., were justified as to direction; and fourteen, or 60.87 per cent., were justified as to velocity. One hundred and forty-five signals of all kinds were ordered, one hundred and eleven, or 76.55 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore six were changed from cautionary. Five signals were ordered late. In one hundred and six cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered; many of these were high local winds or strong sea breezes.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for July, 1884, makes the following statement:

> The verification of railway signals during July was as follows: for temperature, 93 per cent.; for state of the weather, 76 per cent.
>
> The railway weather signals are now in use on all of the divisions of the Hocking Valley and Toledo railroad. It is hoped that they may be placed on other important lines very soon.
>
> At the request of the Board of Trade of the City of Columbus, the signals will be displayed in their rooms in the City Hall, and arrangements are in progress for their display at one or two prominent points in the city.

## ATMOSPHERIC ELECTRICITY.

### AURORAS.

Auroral displays occurred during July as follows:

Eastport, Maine: a brilliant auroral arch was seen from 1 to 2 a. m. of the 25th; the display consisted of a segment of dark haze surmounted by a whitish arch, and waves of light advancing to and receding from the zenith. A similar display was also observed from 9.20 to 11.30 p. m. of the same date.

Mount Washington, New Hampshire: an aurora, consisting of luminous beams extending upward 30°, was visible from 10.10 p. m. of the 3d until midnight. A faint auroral arch was also visible from 8.57 p. m. of the 25th to 1.20 a. m. of the 26th.

Point Judith, Rhode Island: a faint aurora was visible from 8.40 to 9.45 p. m. on the 14th, consisting of a diffuse light of pale straw-color, extending from north-northwest to north-northeast, and to an altitude of 30°; slender beams were observed from 9 to 9.20 p. m.

Portland, Maine: a faint auroral light was visible from 11.30 p. m. of the 19th to 12.20 a. m. of the 20th. On the 25th an irregular auroral arch with streamers extending to the upper edge of "Ursa Major" was observed from 9.20 to 11.50 p. m.

New Haven, Connecticut: an auroral glow, with a few faint streamers, was observed from 9 to 10.30 p. m. of the 26th.

Cambridge, Massachusetts: an auroral arch with streamers was observed about 9.15 p. m. on the 13th. A display was also observed on the evening of the 25th, and displays were suspected on the evenings of the 2d and 20th.

Rochester, New York: a faint auroral display, lasting only a few minutes, was observed at about 10 p. m. of the 19th. On the 25th a display covering the sky from northwest to northeast, and to an altitude of 45°, was observed from 9.15 to 11.30 p. m.

Oswego, New York: a faint auroral display, resembling the twilight, was observed in the north from 10 p. m. of the 19th until the early morning of the 20th.

Cresco, Iowa: faint auroral displays were observed on the evenings of the 15th, 19th, and 25th.

Monticello, Iowa: faint aurora from 9 to 10 p. m of the 9th.

Milwaukee, Wisconsin: a faint auroral light was observed in the north from 8.30 to 10 p. m. on the 13th, the display consisting of a luminous glow with slender beams shooting towards the zenith.

Alpena, Michigan: an aurora was visible from 8 to 11.40 p. m. of the 13th, consisting of a diffuse light in the north, from which pale streamers extended towards the zenith.

Escanaba, Michigan: a faint aurora was visible from 9.35